



# Advanced Land Observing Satellite (ALOS)

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# Topics

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- Background
- Spacecraft / Sensor Characteristics
- Applications
- Data Node Role
- Data Node Concept / Functions / Infrastructure
- Partnership Opportunities

# Background

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- ALOS has three co-registered instruments:
    - Synthetic Aperture Radar (SAR)
    - High-resolution stereo panchromatic imager
    - Medium-resolution multi-spectral imager
  - NASDA together with Ministry of Trade and Industry (MITI) are developing ALOS for June, 2003 launch
  - ALOS will be successor to Marine Observation Satellite (MOS-1, -1b); Japanese Earth Resources Satellite (JERS-1); and, ADvanced Earth Observing Satellite (ADEOS)
  - ALOS also a prototype for future Japan SAR launch
  - Scientific research mission; also, resource survey
  - Commercial partnerships still TBD
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## Background - cont'd

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- NOAA is lead U.S. agency contact for discussions with NASDA regarding U.S. ALOS participation
- NOAA cooperated with NASDA on JERS-1 mission
- NOAA has been an operational user of European Space Agency (ESA) ERS-1 / 2 SAR data
- NOAA and NASA are major users of Radarsat-1 data
- NOAA and U.S. National Ice Center surveying interest by U.S. and Canadian Federal agencies in ALOS data

# Background - cont'd

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- NASDA now establishing international ground networks for archiving and distribution
- ALOS Critical Design Review just completed; new Mission Operations Interface Specification due 3/01
- NASDA seeks Letter Of Interest (LOI) from international space agencies on:
  - Data requirements -- sensors, mode, time of year, geographic regions and applications
  - Overview of proposed Americas Data Node architecture
  - Data Node system development plan and schedule
  - Cooperating agencies/roles; draft Data Node data policy
  - Administrative and engineering points of contact

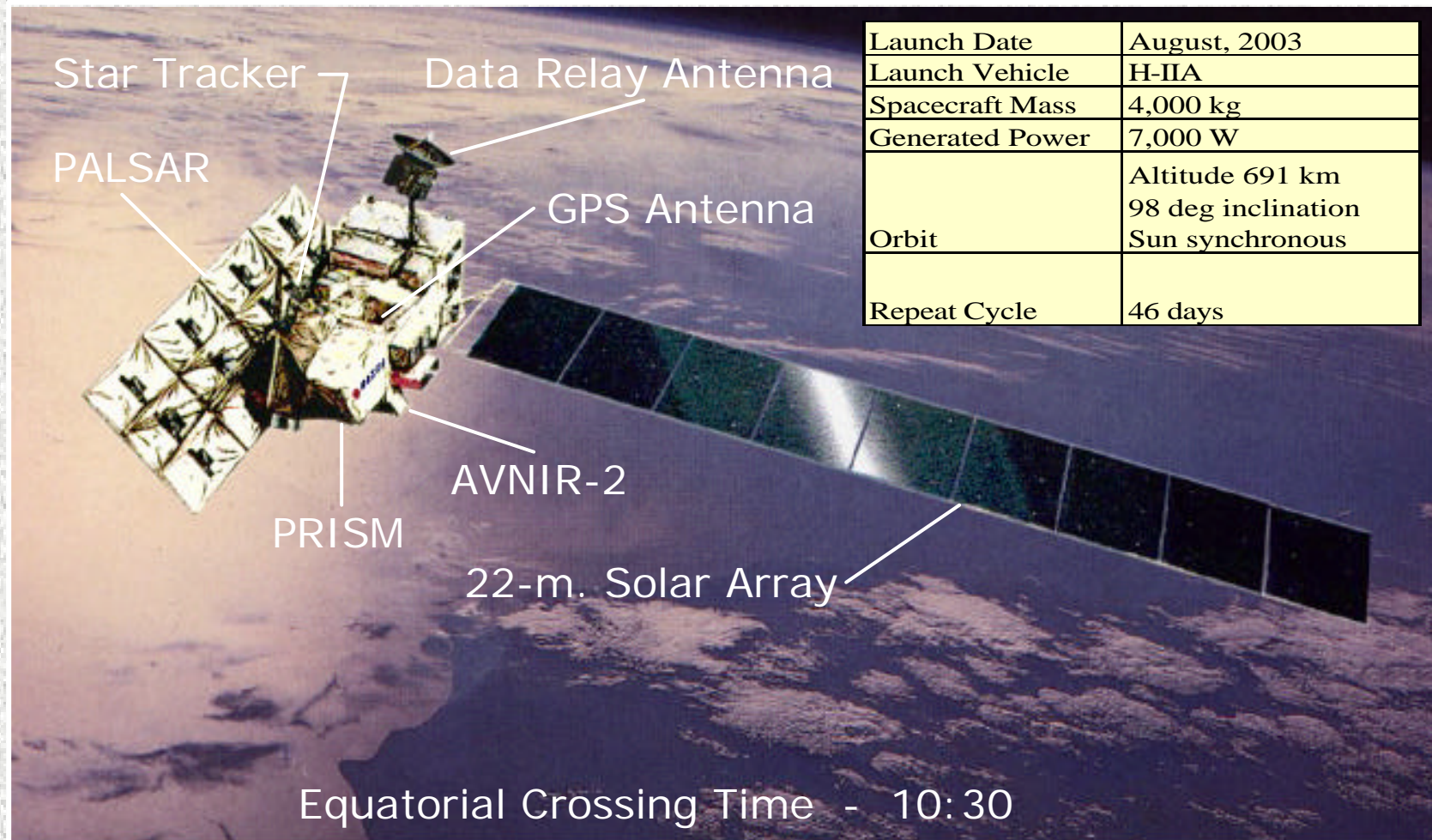
## Background - cont'd

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- ESA signed LOI one year ago as European Data Node; Australian LOI not yet finalized
- Attended 1st and 2nd International Data Node (DN) symposiums - held in Tokyo, 3/00 and Canberra, 12/00
  - ESA (15 members) represented European DN
  - AusLIG / ACRES represented Australia / Oceania DN
  - NOAA represented possible North American DN
  - NASDA would operate Asian DN
- NOAA interested in ALOS partnership arrangements with Government agencies and commercial firms
- 3rd ALOS Data Node meeting June 5-8, 2001 in Tokyo



# ALOS Satellite



# PALSAR Instrument

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- Phased-Array L-band Synthetic Aperture Radar
  - Single/Dual Polarization L-band SAR (1270 MHz)
  - Standard mode:
    - 8-60° incidence angle (typical 39°)
    - 70-km swath width
    - 10-m. spatial resolution
    - 240-Mbps data rate
    - S/N -25dB; S/A 25 dB at 35° look angle
  - ScanSAR mode:
    - 18-43° incidence angle
    - 250-350 km swath width
    - 100-m spatial resolution (multi-look)
    - 120 or 240 Mbps data rate
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# PALSAR Modes

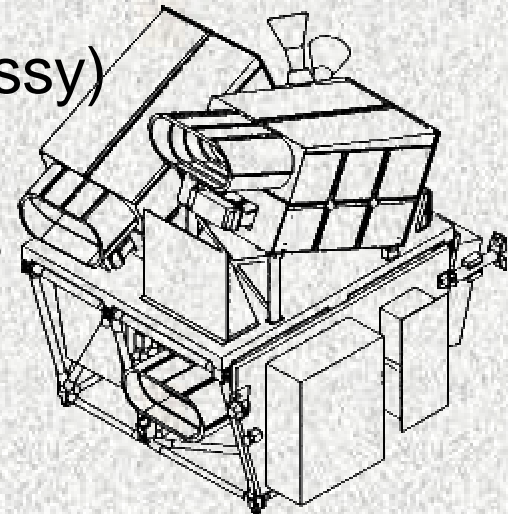
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Mode	High Resolution		Direct Downlink	SCANSAR	Polarimery
	Single Polarization	Dual Polarization			
Frequency	L band (1270MHz)				
Chirp Bandwidth	28MHz	14MHz	14MHz	14/28MHz	14MHz
Polarization	HH or VV	HH/HV or VV/VH	HH or VV	HH or VV	HH/HV +VV/VH
Incidence Angle	8-60deg (typ 39deg)	8-60deg (typ 39deg)	8-60deg (typ 39deg)	18-43deg	8-30deg (typ 24deg)
Range Resolution	7-44m 10m@39deg	14-88m 20m@39deg	14-88m 20m@39deg	100m (Multi-look)	24-89m 30m @24deg
Swath Width	40-70km	40-70km	40-70km	250-350km	20-65km
Bit Length	5 bits	5 bits	3/5 bits	5 bits	3/5 bits
Data Rate	240Mbps	240Mbps	120Mbps	120/240Mbps	240Mbps

# PRISM Instrument

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- Panchromatic Remote Sensing Instruments for Stereo Mapping
- Wavelength 0.52-0.77  $\mu\text{m}$
- 35-km swath width in triplet stereo mapping mode
- 70-km swath width in nadir imaging mode
- 2.5-m IFOV
- 960-Mbps data rate compressed (lossy) to 240 Mbps
- Capable of generating 3-5 m. DEMs



# AVNIR-2 Instrument

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- Advanced Visible and Near Infrared Radiometer - 2
- 70-km swath width
- 10-m IFOV (at nadir)
- $\pm 44^\circ$  pointing angle
- 160-Mbps data rate losslessly compressed to 120 Mbps
- Four spectral bands
  - 0.42 - 0.50  $\mu\text{m}$
  - 0.52 - 0.60  $\mu\text{m}$
  - 0.61 - 0.69  $\mu\text{m}$
  - 0.76 - 0.89  $\mu\text{m}$
- Steerable to obtain coincident coverage with PALSAR

# On-Board Recorder

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- High Speed Solid State Recorder (HSSR)
- 720-Gb solid-state memory
- Simultaneous read and write
- 360/240/120 Mbps (selectable) recording speed
- 240/120 Mbps (selectable) reproduction speed
- Unit is key component to managing ALOS' 600-Mbps data generation capability -
  - PALSAR: 240 Mbps
  - PRISM: 240 Mbps
  - AVNIR-2: 120 Mbps

# Spacecraft Downlinks

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- ALOS has two space-to-ground links:
  - 240-Mbps Ka band link to Data Relay Telemetry Satellite (DRTS)
  - 120-Mbps X-band non-directional downlink to ground stations
- Two DRTS eventually will be operational: East & West
- First satellite will be launched mid-2002
- Second satellite could trail by two years
- Conclusion:
  - Current design very dependent on successful DRTS
  - Ground station network useful to downlink recorded data
  - Real-time data available via direct downlink to Data Nodes



# Applications

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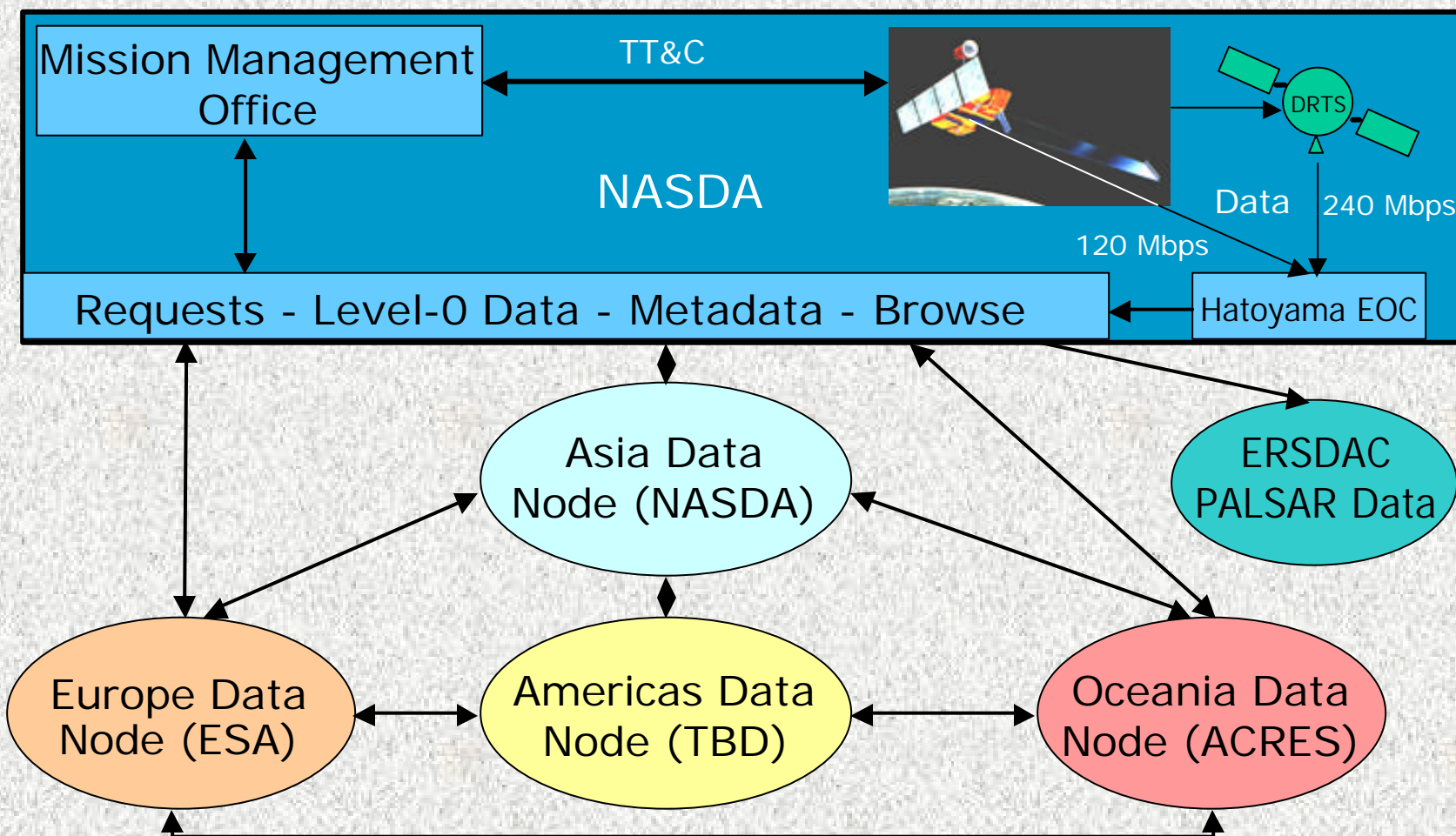
- PALSAR
  - Sea ice mapping
  - Disaster monitoring
  - Ocean Winds
  - Vessel positions
  - Crustal deformation and subsidence measurement
- PRISM
  - Cartography - map generation and revision
- AVNIR-2
  - Natural resource survey
  - Global land-cover classification
  - Global forest inventory

# Role of Data Node

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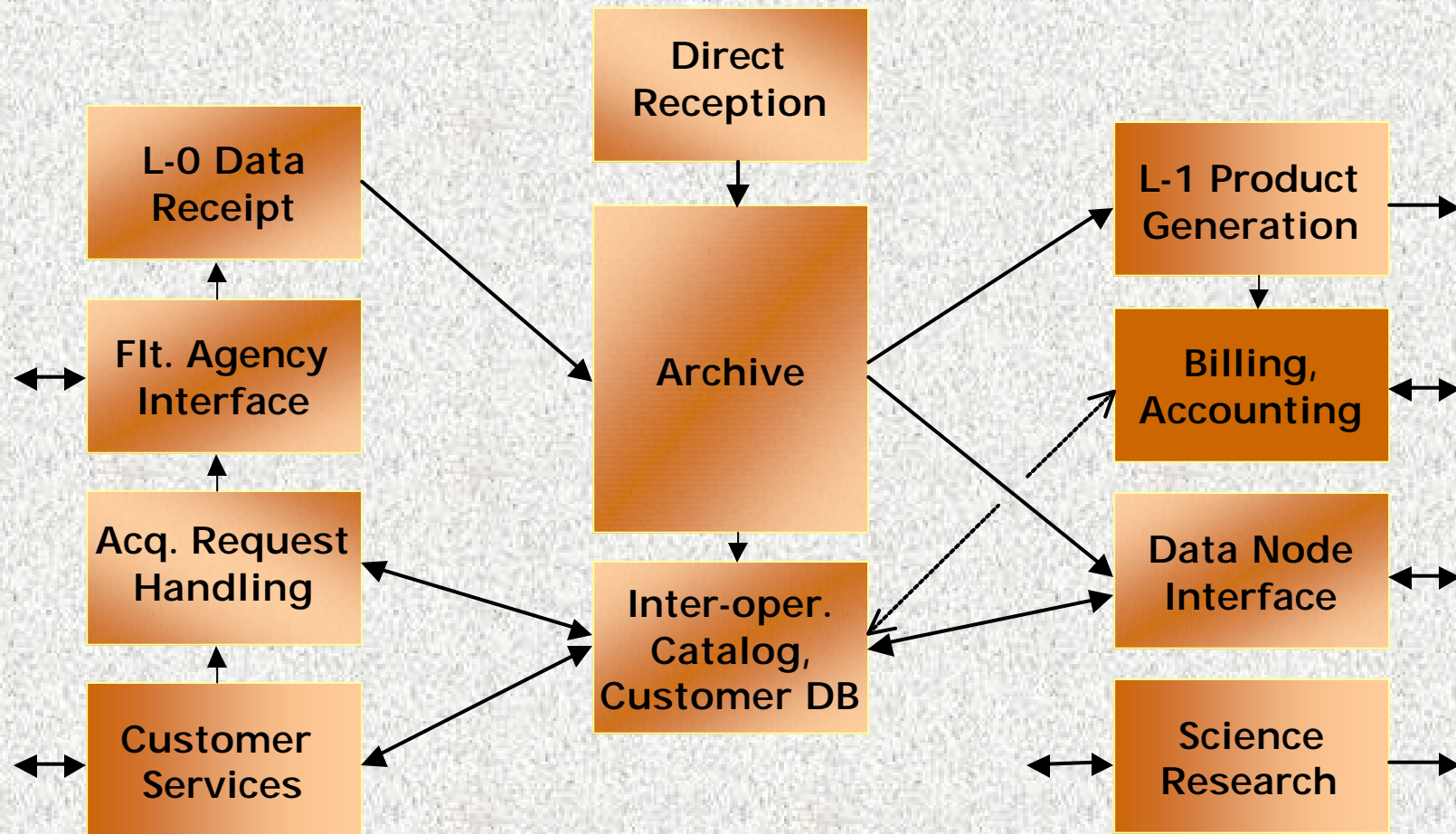
- Generate regional conflict-free acquisition requests
  - Receive regional L-0 data from NASDA
  - Receive direct downlink from satellite (optional)
  - Generate & maintain interoperable catalog and browse
  - Maintain archive of L-0 data for five years
  - Provide WWW query capability
  - Receive and process orders
  - Generate and distribute products
  - Provide L-0 and product data to other regional nodes
  - Contribute to Earth science research
  - Contribute to development of higher-level algorithms
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# Japanese Regional Data Node Concept



# Notional Data Node Functions

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# Partnership Opportunities

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- NOAA has firm operational requirement for SAR data, and would support the proposed international data node concept.
- Partnerships are required to fund development of the North American data node.
- NOAA would welcome participation by U.S. Government agencies and/or industry in ALOS mission support and data utilization